WASHINGTON
SCIENCE TRENDS

HIGHLIGHTS

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* SPECIAL SUMMARY REPORT - GODDARD SPACE FLIGHT CENTER

Here is a Special Summary Report outlining some major program plans of the Goddard Space Flight Center, Greenbelt, Md., an agency of the National Aeronautics and Space Administration. This Center has direct missions in such fields as sounding rockets, scientific satellites, applications satellites, manned flight and tracking; data acquisition and reduction.

The Goddard Center will be responsible for spending over one-third of the total NASA budget for the current fiscal year. This includes $340 million in procurements. Of these, 227 actions will be over $100,000 and 35 will be over $1 million.

✓ Sounding Rocket Purchases: Plans call for 22 Aerobees; 18 Nike-Asps; 20 Nike-Cajuns; 4 Argo D-4's (Javelins); 2 Argo D-8's and 5 Iris.

✓ Orbiting Astronomical Observatory: Preliminary design will be carried forward through 1961, with experiments designed by the University of Wisconsin, Smithsonian Astrophysical Observatory, Princeton University and the Goddard Astrophysics Branch. First launch is scheduled for the Fall of 1963. Typical Control Components include gyroscopes, star trackers, sun sensors, gas jet systems, momentum wheels and a stellar TV system. Typical Communication Components include narrow-band telemetry at 136 MC, Wide-Band telemetry at 400 MC, tracking beacons at 136 MC and antenna systems, command receiver and storage and data storage. Power Components include solar cells and sealed batteries.

✓ Orbiting Geophysical Observatory is planned as a "streetcar" satellite, designed to permit rapid installation of experiments for flexibility in following up new discoveries. POGO is to be a Polar Orbiting Geophysical Observatory for low altitude studies of the earth's atmosphere and ionosphere. EGO is to be an Eccentric Geophysical Observatory for highly elliptical, low inclination orbits for the study of energetic particles and magnetic fields.

✓ Communication Satellites are also a Goddard responsibility. R&D contracts to be let include studies of steerable antenna arrays, $200,000; satellite configurations, $100,000; passive satellite materials, $100,000; rigidization techniques, $150,000 and development of instrumentation system for passive satellites, $150,000. Under flight programs, contracts to be let include a multiple sphere systems study, $600,000 and development of rigidized sphere, $1 million. Other studies include economic and social impact, being carried out by the Rand Corporation; requirements imposed by existing ground networks, by Stanford Research Institute as well as comparisons of the relative merits of various systems and operational techniques.

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✓ Tracking Systems under Goddard Center direction expects to spend some $2,100,000 in contracts this fiscal year. Contracts will include:

Advanced System Development ($800,000) for Data Acquisition including antennas, pre-amplifiers, beacons and converters; Tracking Systems Equipment including beacons, ranging equipment and a daylight optical system; Timing Systems, including development of a rubidium vapor frequency standard and Calibration including data reduction and a star catalog.

Major Equipment Procurement ($800,000) will include optical test equipment, optical components, electronic-optics, tape recorders, receivers, transponders, electronic test equipment, tracking filters and combfilter spectograph.

Major Study Contracts ($495,000) will include high gain antennas including servo drives and calibration; standard time systems including maser development and propagation; telemetry reception, system and parametrics and an advanced tracking systems including infra-red tracking, ranging and on-site data reduction.

✓ Data Systems Division divides its contract work into Mathematics/Computation and Data Techniques. Spending plans include:

Mathematics/Computation ($3,100,000) for rentals, supplies and contractual services for computer operations and for study contracts in the field of orbit computation and advanced computing systems.

Data Techniques ($1,500,000) for study contracts on data reduction; advanced development contracts on weak signal enhancement, digital conversion and editing, terminal equipment and memory equipment; and input, conversion and terminal equipment for a data reduction center.

✓ Project Apollo (SCIENCE TRENDS, Aug. 1, 1960) is the follow-on manned spacecraft program to Project Mercury. NASA will invite interested contractors to a Bidder's Conference at Langley Field, Va., Sept. 12, 1960. Proposals are to be received by October 10, 1960, with contracts awarded November 14, 1960.

There will be six-month feasibility studies to define a system for meeting mission requirements, to formulate a program plan for implementation, to identify areas requiring long-lead-time R&D effort and to analyze the cost of providing the system. For the system itself, fixed-fee contracts will be used and several concurrent contracts are expected.

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* NUCLEAR PROPULSION OFFICE

Harold B. Finger, Chief of Nuclear Propulsion for NASA will become manager of a new joint AEC-NASA Nuclear Propulsion Office to be located at AEC Headquarters, Germantown, Md. The Office will "integrate" the Project Rover nuclear powered development programs. AEC will have primary responsibility for development of all reactors and their components, including those for flight missions specified by NASA. The space agency will have primary responsibility for research and development of non-nuclear components and integration of the nuclear components in engines and vehicles of rocket systems. Deputy Manager of the new office will be Milton Klein, who has been assistant manager of the AEC's Chicago Operations Office.

Meanwhile, the Air Force continues to go its own way in this field. Air Force Flight Test Center, Edwards Air Force Base, Calif. has signed a half-million dollar contract for "sound propulsion system data to contractors considering nuclear rocket propulsion from a mission standpoint." Studies will be made by Thiokol Chemical as prime contractor with Allison Division, General Motors, Linde Company and the Nuclear Development Corp.

✓ RARE EARTHS: Projects will include extraction and separation, physical metallurgy, and fused-salt electrowinning in the light and heavy subgroups of the rare-earth elements and yttrium. At the Bureau's Reno, Nev. center, studies will include investigations of new amine, organic phosphate and arsenate extractants, ultrasonic and electromagnetic extracting techniques; and corrosion problems associated with solvent extraction projects. Also at Reno, fused-salt electrowinning will be emphasized in search of continuous production of higher-purity rare-earth metals. Zone-refining techniques will be used to purify further the electrolytic cerium obtained from controlled-atmosphere-temperature-pressure cell boxes. And as these methods become successful they will be extended to other high-purity electrolytic rare earths, and to yttrium.

Studies relating to electrowinning light and heavy subgroups of the rare-earth elements and yttrium will be made on electrolytic bath compositions, melting points, surface tension, oxide solubilities, densities and electrode reactions. As the rare-earth elements and yttrium become available in relatively pure form from the electrolytic reduction studies, physical and mechanical constants of the high-purity metals, either as single pure metals or alloys, will be obtained.

The effects of rare-earth metals in steels will be studied at the Rolla, Mo. center, where new and improved magnesium-base rare metal alloys for service at elevated temperatures will be sought.

✓ URANIUM AND THORIUM: Uses for depleted uranium will continue to be a major goal, with studies already demonstrating that high-strength steel alloys and improved-quality bearing metals can be obtained. The Bureau's Bruceton, Pa. laboratories are working to develop a depleted-uranium catalyst that can minimize atmospheric pollution from automobile exhaust gases. At Salt Lake City, experiments will be made with combined physical and chemical upgrading processes for low-grade and complex uranium ores. Tests will emphasize specific collectors for direct flotation of uranium minerals, to control slimes, to develop procedures for making a throwaway lime concentrate from limey ores, and to remove sulfides selectively without prohibitive loss of uranium in treating high-sulfide uranium ores.

Other studies at Reno and Boulder City, Nevada will concentrate on methods for electrowinning and electrorefining uranium metal. At Albany, Ore., the modification of the so-called Kroll process for producing high purity thorium will be emphasized. Radiation sources, neutron sources, specific isotopes and other nuclear aids will be used.

✓ COLUMBIUM AND TANTALUM: Bureau metallurgists, seeking improved methods for recovering columbium and tantalum from their ores, will experiment with direct chlorination of such raw materials as columbite, tantalite, euxenite and pyrochlore. Development of new or improved solvent-extraction systems for separating the two elements also is underway, and several methods for reducing them to metal are being investigated. Fused-salt electrorefining techniques will be applied to the recovery of high-purity columbium on a laboratory scale. An extended study of the physical properties of metamict minerals, including columbite and tantalite is being paralleled by development and refinement of analytical techniques. In addition, an investigation of the physical and chemical properties of columbium and tantalum and their alloys is scheduled for completion, and information on columbium-titanium alloys for high-temperature duty will be gathered.

(CONTINUED NEXT WEEK)

ROYALTY-FREE PATENT CHECKLIST

Here is a new listing of Government-owned patents now available for use by industry on a royalty-free basis. Subscribers desiring further information may write Service Department, Washington SCIENCE TRENDS, 1120 National Press Bldg., Washington 4, D. C.

You will be furnished with the patent number and classification, and information on where to obtain the patent, and where to apply for licensing.

( ) GRAPHITE COATING: This patent describes a method for producing refractory coatings of metallic carbides on graphite. The piece to be coated must first be immersed in a molten solution of zirconium, titanium or niobium dissolved in tin.

( ) ROTARY SWITCH: This compact, rotary-type switch has an insulating shell which carries circumferentially spaced contacts exposed to its interior. It also features resilient contact arms.

( ) FEED BACK AMPLIFIER: This is a plural-stage, non-blocking degenerative feed back amplifier said to be particularly suitable for counting circuits because of stability and linearity in operation.

( ) CONTROL LIMITING DEVICE: Monitoring a control system is said to be simplified with this system which includes a condition sensing device, a condition varying device and a means of control permitting switching from automatic to manual operation.

( ) PROTECTING FERROUS METAL SURFACES: This method is said to make possible the protection of ferrous metal surfaces from corrosive attack by liquid metals, such as liquid bismuth or lead-bismuth alloys by forming an adherent zirconium carbide layer.

( ) CONTINUOUS GAS ANALYZER: This system is said to continuously and dynamically measure the concentration of one selected gas in a flowing gas mixture.

( ) GAS CLEANING APPARATUS: This apparatus uses electrostatically charged pellets for cleaning gases. The pellets are blown past baffles in a conduit and into the center of a rotating body of the gas to be cleaned.

( ) ISOTOPE SEPARATION: This process employs an improved calutron receiver with two entrance slots leading to two electrically isolated pockets for the electromagnetic separation of isotopes.

( ) ATOMIC ELEMENT DETECTION: This invention is said to facilitate the detection of specific atomic elements in a substance. It is said to be particularly applicable to well logging.

( ) TWO-WAY FREEZE VALVE: This valve is used for closing off the flow of radioactive and corrosive gases and liquids or mixtures, and forming a leak-tight barrier. An unusual feature is the fact that the valve has no mechanical moving parts which would require design to close tolerances.

RESEARCH CHECKLIST

- TIRE POWER LOSS: Laboratory studies by R. D. Stiehler of the National Bureau of Standards indicate that the use of natural rubber has a "pronounced effect" in lowering power losses, reducing temperatures and increasing gas mileage when compared with tires of styrene-butadiene synthetic rubber. The studies have particular application to truck tires where high temperatures are an important problem and where abrasion resistance -- an asset in synthetic tires -- is of secondary importance. Research also showed that power loss is greatest in nylon tires at low speeds and in rayon tires at higher speeds. Steel wire cord truck tires were found to be superior through all speed ranges tested.

  (For details write National Bureau of Standards, Office of Technical Information, Washington 25, D. C.)

- PARAGLIDER RESEARCH: Studies by the National Aeronautics and Space Administration (NASA) indicate that a flexible-lifting-surface concept may provide a lightweight, controllable paraglider for the recovery of manned capsules and equipment from space. The structure can carry loads primarily in tension and with a minimum of weight. Weaving light-weight, high temperature glass fibers into cloth is one proposed technique. It would have the advantages of low weight and small area during launch, low acceleration and temperature during reentry and stability, control and performance required to glide to a predetermined site at low or moderate speed.

  (For details write National Aeronautics and Space Administration, CODE BID, Washington 25, D. C. for NASA Technical Note D-443. Single Copies Free while available.)

- HIGH PRESSURE OXYGEN VESSELS: Air Force studies indicate that there may be theoretical advantages to the use of high pressure oxygen storage vessels for aircraft and space vehicle missions of "moderate" duration. Advantages are said to include low vessel weight and volume, and the ability to function easily under the influence of zero gravity and acceleration. However, the high-pressure vessels must be proved feasible and safe, and advances in converters may alter present concepts.

  (Report of February, 1960 now available. 23 pages. 75 cents. Write OTS, U. S. Department of Commerce, Washington 25, D. C. for WADC Tech. Report 59-767.)

- TURBOJET ENGINE SOUND BARRIER: The Federal Aviation Agency has expressed interest in a proposal for investigation of the sound-attenuating properties of batteries of water sprays to be used when turbojet engines are being warmed up. It is believed that the sprays would work both by acting as a solid barrier and by cooling the hot, turbulent gases. The spray barrier would be "erected" only when a plane was about to take off, and thus would not be in the way of a landing aircraft.

  (Proposal by Cornell Aeronautical Laboratory, reported by E. R. Quesada, Administrator, Federal Aviation Agency, Washington 25, D. C.)

PUBLICATION CHECKLIST

- BASIC RESEARCH FUNDS, a statistical study by the National Science Foundation covering the years 1953 to 1958 and purporting to show that the nation is spending about $1 billion for basic research in 1960. 11 pages. 15 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for Publication NSF 60-43.)

- SATELLITE AND SPACE PROPULSION SYSTEMS, an unclassified version of material originally presented at a 1957 Flight Propulsion Conference, still surprisingly up-to-date. Provides an excellent background in such fields as batteries, nuclear-electric powerplants, solar turboelectric systems, ion acceleration and other systems. 47 pages. Single Copies Free. (Write National Aeronautics and Space Administration, CODE BID, 1520 H Street, N. W., Washington 25, D. C. for Technical Note D-285.)

- ATOMIC POWER DEMONSTRATION PROJECT, testimony, statements and exhibits presented at a Congressional hearing on a 75,000 kw electrical boiling water reactor plant at Big Rock Point, Charlevois County, Mich. 31 pages. Single Copies Free. (Write Joint Committee on Atomic Energy, F-88, The Capitol, Washington 25, D. C.)

- HIGH-TEMPERATURE CERAMICS AND CERMETS, a paper describing high-temperature ceramics and cermets and some of their fabrication data; bulk densities; theoretical densities; and dynamic room-temperature elastic constants. Data given for 46 sets of specimens representing 20 different materials including oxides, carbides, borides, cermets and an intermetallic compound. 45 pages. 20 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for Publication No. C 13.44:6.)

- GOVERNMENT RESEARCH BIBLIOGRAPHIES: The following selective bibliographies listing Government research reports and other technical documents available to science and industry may now be obtained (at 10 cents each) from OTS, U. S. Department of Commerce, Washington 25, D. C.:

  SB-401 Corrosion
  SB-402 Welding
  SB-403 Food Preservation by Irradiation
  SB-404 Rare Earth Elements
  SB-405 Reliability and Quality Control
  SB-406 Adhesives
  SB-407 Linear Programming
  SB-408 Wood

- STATE NUCLEAR POWER REGULATION, a report briefly summarizing some of the problems faced by state utility commissions, and the actions they are taking, in establishing accounting systems for utility firms under their jurisdiction which are expending funds for research and experimental work on the generation of electricity by nuclear power. 11 pages. 50 cents. (Write OTS, U. S. Department of Commerce, Washington 25, D. D. for TID 8208.)

- MICROWAVE ENERGY TRANSMISSION: A reprint of an Army manual which discusses the behavior of microwaves and describes some of the specialized components used in microwave equipment. 204 pages. $1. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for Publication No. D 101.11:11-673.)

- FLOW OF INFORMATION AMONG SCIENTISTS, a review by Columbia University specialists on "the behavior, habits, usages, experiences and expressed needs of research scientists." Two Volumes, 110 Pages. Single Copies Free. (Write Information Office, National Science Foundation, Washington 25, D. C. for "Review of Studies in the Flow of Information Among Scientists.")